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DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Oil Combustion Apparatus

We, MATSUSHITA ELECTRIC INDUSTRIAL CO. LTD., a Corporation organised under the laws of Japan, of 1006, Oaza Kadoma, Kadomashi, Osaka, Japan, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention relates to oil combustion apparatus of the multi-wick type in which a multiplicity of wick guide tubes spaced apart a small distance therebetween are vertically annularly disposed between a fire tray in the combustion section and a reservoir containing fuel oil therein and wicks are arranged to be moved upwardly and downwardly in the wick guide tubes.

In oil combustion apparatus of multi-wick type, the wicks are disposed independently of one another and thus combustion air can freely be supplied to the periphery of each wick. By virtue of this structure, an increased amount of combustion can be obtained compared with a cylindrical wick and satisfactory combustion can thereby be effected. Cotton wicks presently used in oil combustion apparatus are defective in that they are consumed relatively quickly and removal of deposits on the wicks requires considerable time and labour. A cutter is generally used to remove the deposits mechanically from the cotton wicks. Since however the deposits adhere firmly to the wick, a considerable force must be applied to tear off the deposits together with that portion of the wick or cut away the wick portion having the deposits thereon. Therefore, a large proportion of the wick is wasted and it has to be frequently replaced. Furthermore if the cotton wick should be burnt unintentionally in the absence of fuel it is likely to be ruined. Thus, it is difficult to remove the deposits from wicks mechanically, and this is especially so in the case of multi-wick type oil combustion apparatus because the wicks therein are independent of one another. The nature of the deposits is such that the deposits decompose and are burnt off when heated to a temperature above 400°C. In oil combustion apparatus, however, the temperature at the upper portion of a wick is generally slightly in excess of 100°C under a normal combustion condition of the wick. In order therefore to bring the temperature at the upper portion of the wick to a high temperature of more than 400°, the wick must be burnt in an abnormal state of combustion, for example, under a state of combustion without any fuel supply thereto. By thus causing the wick to burn in an abnormal state of combustion, it is possible to remove deposits accumulating on the wick but this manner of removal is impracticable with a cotton wick because it is readily consumed. This manner of deposit removal can easily be carried out in the case of a heat resisting wick such as one made of glass fibres, carbon fibres, sintered alloy or ceramics. But due to the continuous structure of the wick extending from a lower portion thereof immersed in the fuel reservoir to an upper portion thereof disposed near the fire tray, fuel oil in the fuel reservoir must be exhausted during each operation of deposit removal so that the wick can be burnt in the absence of fuel, which operation of deposit removal is extremely troublesome. Further, this type of wick has the disadvantage in that it has unsatisfactory fuel suction with attendant unsatisfactory combustion and in addition it is quite expensive. Moreover, a high material cost will be involved in the use of a heat resisting wick of sufficient length to

reach the level of the fuel oil.

It is an object of the invention to provide a wick from which removal of deposits accumulating on its burning portion can be effected and which has satisfactory combustion characteristics while at the same time it is inexpensive to use. This object is achieved in accordance with the invention by using a composite wick comprising a combustion portion made of non-inflammable material, such as glass fibres, carbon fibres, sintered alloy, or ceramics, and a suction portion made of high fuel absorbtive and fuel resisting material, such as cotton, staple fibres, asbestos or chemically synthesized fibres, the lower end of the combustion portion and the upper end of the suction portion being separably interconnected by one or more separable contact cloth members made of high fuel absorption-type material such as felt.

In a preferred embodiment of the invention the removal of deposits is simplified if the two portions are separable so that the combustion portion can be lifted out of contact with the suction portion to interrupt the fuel supply to the combustion portion and thus effect burning of the combustion portion in the absence of fuel.

The invention may advantageously be applied to oil combustion apparatus in which the wick is made up from a number of small circular portions arranged around the circumference of a circle. In this case the layer(s) of fuel absorbent material may be in the form of an annulus connecting all the wicks and to ensure even combustion an ignition ring may be provided near the top of the wicks.

A further feature of the invention is the provision of a pilot wick, which may be ignited electrically, for the lighting of the wick or wicks of the apparatus.

In order to determine the state of combustion of the combustion portion an indicator may be provided so that it is activated by the wick controlling lever or spindle of the apparatus.

The invention will now be further described by way of example with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of an embodiment of oil combustion apparatus according to the present invention;

Fig. 2 is an enlarged plan view of the oil combustion apparatus of Fig. 1 with parts of its combustion section cut away to show the internal structure;

Fig. 3 is a longitudinal sectional view taken substantially on the line A-A in Fig. 2;

Fig. 4 is an enlarged perspective view of a link plate and parts associated therewith for causing vertical movement of wicks in the apparatus of Fig. 1;

Figs. 5A, 5B, 5C and 5D are explanatory views showing the relation between the link plate and a pin at a bearing section in Fig. 4;

Fig. 6 is an enlarged perspective view of means for displaying the state of burning of wicks for deposit removal in the oil combustion apparatus of Fig. 1;

Figs. 7*a* and 7*b* are fragmentary sectional views of the combustion section of the oil combustion apparatus, Fig. 7*a* showing the section taken on the line B-B in Fig. 2 and Fig. 7*b* showing the section taken on the line *c-c* in Fig. 2;

Fig. 8 is a perspective view of a wick mounting plate means for holding the lower ends of upper wicks, a wick mounting plate means for holding the upper ends of lower wicks, and a control and guide means for guiding both of the plate means; and

Figs. 9 to 13 are schematic explanatory views showing various other embodiments of the oil combustion apparatus according to the invention.

Referring to Fig. 1 at first, there is shown a perspective external view of the oil combustion apparatus of the invention which comprises a main fuel reservoir 1 containing fuel such as kerosene therein and having an oil gauge 2 and an oil filling port 3 provided thereon. Centrally of the apparatus, there is provided an oil combustion section which is covered by a cover member 4, and a cylindrical funnel 5 is placed on the combustion section. On the rear side of the combustion section, there is provided a reflecting plate 6 for reflecting the heat of combustion in the forward direction. A guard member 7 is swingably hinged to an upper part of the reflecting plate 6 and depends downwardly in front of the combustion section.

A handle 8 is fitted to the upper part of the reflecting plate 6 and support legs 9 are fitted to the bottom of the fuel reservoir 1 to support the combustion apparatus on a base plate 10. A window 11 is formed in the cover member 4 in order to display a state of operation of a wick operating knob 17 so that an indication such as "normal combustion" or "flame extinguished" can be seen.

An auxiliary reservoir 12 is detachably fitted in a central opening formed in the main fuel reservoir 1 and a packing 13 is inserted therebetween to provide oil-tight seal. The auxiliary reservoir 12 consists of a cover member 14 and a reservoir body 15. A plurality of perforations are annularly bored through both the upper wall of the cover member 14 and the bottom wall of the reservoir body 15 in aligned relation to each other.

An operating mechanism enclosure 16 is fixed on the central portion of the cover

member 14 and an operating shaft 18 having thereon the above described knob 17 axially slidably penetrates the enclosure 16. A pinion 19 is mounted on the operating shaft 18 in the operating mechanism enclosure 16 to slide along a groove 20 in the shaft. Collars 21 in the operating mechanism enclosure 16 limit the axial movement of the pinion 19. A rack 22 arranged for vertical movement passes through the enclosure 16 and the cover member 14 of the auxiliary reservoir 12 and meshes with the pinion 19.

An engaging pin 23 is mounted on that end of the operating shaft 18 projecting rearwardly through the enclosure 16. A link collar 24 is loosely mounted on that portion of the operating shaft 18 projecting rearwardly through the enclosure 16. A link plate 25 is firmly secured to the link collar 24 and has a portion extending towards the pin 23 to form an abutment 25', the tip portion of which is arranged to abut the pin 23. A helical spring 27 is coiled about the operating shaft 18 between the engaging pin 23 and the link plate 25 to urge the shaft 18 normally away from the enclosure 16. A helical spring 26 is coiled about the link collar 24 so that one end thereof is fixed to the link plate 25 and the other end fixed to the enclosure 16. That portion of the operating shaft 18 carrying the knob 17 thereon is journalled in a bearing 28 (figure 5) provided on the cover member 14 of the auxiliary reservoir 12. The bearing 28 takes substantially the form of a box of shallow depth and is provided with a projection 29 on its bottom. A stop member 31 having a projection 30 is provided at one corner of the bearing 28 in a manner that it is spaced from the bottom on the side of the knob 17. A pin 32 is firmly secured to the operating shaft 18 at the position of the bearing 28 and is normally urged onto the bottom of the bearing 28 by the helical spring 27.

A substantially flat wick mounting plate 33 is mounted on the lower end of the rack 22 in the auxiliary reservoir 12 and is provided with a plurality of perforations aligned with those of the cover member 14 and the body 15 of the auxiliary reservoir 12. A wick guide tube 34 of small diameter has its lower end inserted in each of the perforations formed in the reservoir cover member 14 and flared laterally outwardly to secure it firmly in position. An outer sleeve 35 is coaxially fitted on each wick guide tube 34. The upper ends of the outer sleeves 35 extend slightly above the upper ends of the associated wick guide tubes 34 thereinside and are flared laterally outwardly so as to hold between their end edges an annular plate 36. A fire tray 37 of annular trough-like structure is supported on the plate 36 to surround between its upstanding walls on the upper openings of the wick guide tubes 34.

An annular heat shield 38 is suitably fitted to intermediate portions of the outer sleeves 35 to shield the combustion section from the reservoir cover member 14 and has a cylindrical wind shield 38' detachably mounted at its periphery. Combustion wicks 39 of heat resisting material such as glass fibers, carbon fibers, sintered alloy or ceramics are supported in a plurality of wick supporting tubes 40 which are fixed at their lower ends in the perforations of the wick mounting plate 33. The upper end of each wick supporting tube 40 extends into the aligned wick guide tube 34. A contact cloth member 41 of high fuel absorption-type material such as felt is fixed to the wick mounting plate 33 and is in contact with the lower ends of the combustion wicks 39. There is also provided a second wick mounting plate 42 of a shape similar to the wick mounting plate 33. The second wick mounting plate 42 is also provided with a plurality of perforations in which are fixed the upper ends of suction wicks 43 of high oil absorptive and oil resisting material such as cotton, staple fibers, asbestos or chemically synthesized fibers. The lower ends of the suction wicks 43 extend downwardly through the perforations formed in the bottom of the auxiliary reservoir body 15 into the main fuel reservoir 1. A contact cloth member 44 of high fuel absorption-type material such as felt is fixed to the wick mounting plate 42 and is in contact with the upper ends of the suction wicks 43. The contact cloth member 44 is disposed opposite the contact cloth member 41 for relative movement towards and away from the latter. Therefore, the fuel in the main fuel reservoir 1 is sucked into the contact cloth member 44 through the suction wicks 43, thence through the contact cloth member 41 for supply to the combustion wicks 39.

The wick mounting plates 33 and 42 are formed with slots 46 through which pass a control and guide member 45 and slots 47 through which the top portion of the member 45 can pass. The slots 46 and 47 in the plate 33 are 90° displaced relative to those of the plate 42 as shown in Fig. 8. The control and guide member 45 is firmly fixed on the central inner bottom face of the auxiliary reservoir body 15 and is substantially U-shaped. The tip portions of opposed legs of the member 45 extend upwardly through the slots 46 of the wick mounting plate 42 and are bent at sufficiently high positions on the legs to form stoppers 48 so that the stoppers 48 may not abut the mounting plate 42 under the normal operating condition. A helical spring

49 is interposed between the bottom of the auxiliary reservoir body 15 and the wick mounting plate 42 to urge the wick mounting plate 42 hence the contact cloth member 44 towards the contact cloth member 41. A helical spring 50 is coiled about each of the wick supporting tubes 40 in the auxiliary reservoir 12 and is compressed between the wick mounting plate 33 and the cover member 14 when the associated combustion wick 39 is urged upwardly.

An ignition ring 51, which may be made of glass fibers or the like, is disposed in the fire tray 37 so as to contact the tips of the combustion wicks 39 for receiving the supply of fuel from the wicks 39. A fire extinguishing tube 52 (figure 7*a*) extends upwardly from the reservoir cover member 14 at a position intermediate between two arbitrarily selected wick guide tubes 34 and terminates at a position approximately halfway of the vertical distance between the cover member 14 and the fire tray 37. An auxiliary wick 54 for ignition purposes is supported in a tube 53 which is accommodated in the fire extinguishing tube 52 for vertical movement therein. Therefore, the tip of the auxiliary wick 54 appears and disappears from the top opening of the fire extinguishing tube 52 by the vertical movement of the wick supporting tube 53. An abutment 56 having a tongue 55 is fixed to the lower end of the wick supporting tube 53 and is engaged by the wick mounting plate 33 in the upward movement of the plate 33 so as to cause the upward movement of the auxiliary wick 54. A helical spring 57 is coiled about the supporting tube 53 between the abutment 56 and the inner face of the reservoir cover member 14 in order to normally urge the supporting tube 53 downwardly so that the auxiliary wick 54 is always retracted into the fire extinguishing tube 52. An L-shaped guide plate 58 is fixed to the inner face of the reservoir cover member 14 in a manner that its depending portion is disposed in parallel with the supporting tube 53. The depending portion has a longitudinal guide slot through which the tongue 55 of the abutment 56 extends. The lower portion of the auxiliary wick 54 supported in the supporting tube 53 is immersed in the fuel in the main fuel reservoir 1 like the wicks 43. A substantially U-shaped member 59 (figure 7*b*) is directly mounted for free pivotal movement on one of the wick guide tubes 34 positioned adjacent the auxiliary wick 54 in a manner that the guide tube 34 penetrates parallel legs of the pivotal member 59. The upper leg of the pivotal member 59 makes sliding contact with the lower face of the plate 36 and acts as a cover 61 normally to close an ignition aperture 60 formed in the fire tray 37 and the plate 36 at a position opposite the tip portion of the fire extinguishing tube 52 hence the tip portion of the auxiliary wick 54. A connecting rod 62 is loosely mounted at one end in the pivotal member 59 operatively to connect the same with the link plate 25 so that the pivotal movement of the link plate 25 by the rotation of the operating shaft 18 can rotate the pivotal member 59 by way of the connecting rod 62 to thereby open the normally closed aperture 60. A helical spring 63 is provided at the lower portion of the wick guide tube 34 carrying thereon the pivotal member 59 so as normally to urge the cover 61 of the pivotal member 59 towards sliding contact with the lower face of the plate 36.

A heater supporting member 64 (figures 2, 7*a*) is suitably provided to support an ignition heater 65 for igniting the auxiliary wick 54 at a position above the fire extinguishing tube 52. Contact strips 66 for the ignition heater 65 are fitted to a portion of the heater supporting member 64 in electrically insulated relation thereto and normally remain open. When, however, the connecting rod 62 is advanced by the rotation of the operating shaft 18, the pivotal end 67 of the connecting rod 62 at the pivotal member 59 urges one of the contact strips 66 towards the other to conduct current to the ignition heater 65. Thus, by the mere rotation of the operating shaft 18, the conduction of current to the ignition heater 65, opening of the aperture 60 and upward movement of the auxiliary wick 54 can simultaneously be effected. Lead wires 68 and a battery mounting member 69 (Figures 2, 3) are provided for current supply to the heater 65.

It is so arranged that the operating shaft 18 can freely rotate until the engaging pin 23 is abutted by the abutment 25′ of the link plate 25, and the combustion wicks 39 suitably protrude above the fire tray 37 for proper combustion at such position of the pin 23 at which it is abutted by the abutment 25′. Further rotation of the operating shaft 18 causes the pivotal movement of the link plate 25 against the force of the spring 26. An abutment 70 is provided on the operating shaft 18 between the bearing 28 and the knob 17. An L-shaped supporting plate 71 (figures 3, 6) is fixed at one panel thereof on the upper face of the reservoir cover member 14, and the operating shaft 18 extends through a bore in the other or upstanding panel of the plate 71. An eyelet 72 is fitted in this bore to permit free passage of the shaft 18 in the bore. An arcuate slot 73 is bored through the upstanding panel at a position above the eyelet 72. A display plate 74 is pivotally mounted on the eyelet 72 to display the operating condition such as burning of wicks for deposit re-

moval and others. The indication of any particular operating condition can be seen from outside through the window 11 of the cover member 4 covering the combustion section. A portion of the display plate 74 is cut open to form a lug 75 and made to protrude towards the combustion section through the slot 73 of the supporting plate 71. A helical spring 76 is provided in tension between the lug 75 and the supporting plate 71 to normally urge the display plate 74 in one direction. It is so arranged that, when the operating shaft 18 is pulled forwardly against the force of the spring 27, the abutment 70 is moved to a point at which it abuts the lug 75. When the operating shaft 18 is rotated under the above condition, the abutment 70 urges the lug 75 so that the display plate 74 can pivot against the force of the spring 76. In this case, the position of the engaging pin 23 is displaced and there is no engagement between the pin 23 and the abutment 25' so that the combustion wicks 39 can be urged upwardly independently of the ignition unit.

In the oil combustion apparatus described above, the normal operative state of the apparatus is as shown in Fig. 3 and combustion is made under such state. Or more precisely, rotation of the operating shaft 18 causes engagement of the engaging pin 23 with the abutment 25' of the link plate 25 so that the tip portions of the combustion wicks 39 are exposed above the fire tray 37 by an amount suitable for proper combustion. By further rotation of the operating shaft 18, the pin 23 urges the link plate 25 to pivot it against the force of the spring 26 and the combustion wicks 39 are urged further upwardly by the action of the rack 22 and the pinion 19. The spring 49 causes the suction wicks 43 to follow the movement of the combustion wicks 39 so that the fuel can be supplied continuously to the combustion wicks 39 through the contact cloth members 41 and 44. The relation between the link plate 25 and the pin 32 at the bearing 28 is as shown in Figs. 5A to 5D in which the relation successively changes from a state of Fig. 5A to a state of Fig. 5B, then to a state of Fig. 5C. Under this state, the wick mounting plate 33 is in its upward position and during the upward movement, it urges upwardly the lower end of the supporting tube 53 against the force of the spring 57 and thus the tip portion of the auxiliary wick 54 is exposed above the top opening of the fire extinguishing tube 52. The pivotal movement of the link plate 25 causes the pivotal movement of the pivotal member 59 through the connecting rod 62 connected therebetween and at the same time the pivotal end 67 urges the contact strips 66 towards each other to place the ignition heater 65 in operation, the heater 65 igniting the auxiliary wick 54 exposed above the top opening of the fire extinguishing tube 52. The pilot flame burning on the auxiliary wick 54 ignites the ignition ring 51 through the opened aperture 60 and the flame subsequently spreads to the combustion wicks 39 for combustion of oil thereon. When under this combustion condition the grasping force on the operating knob 17 is released, the operating shaft 18 is rotated in the reverse direction through the link plate 25 by the action of the spring 26 to the normal operative position at which the combustion wicks 39 are exposed by a predetermined amount and combustion continues under this state. The relation between the link plate 25 and the pin 32 at the bearing 28 under normal combustion is as shown in Fig. 5B. Under the state of Fig. 5B, the pivotal member 59 and the auxiliary wick 54 have returned to their original positions and there is no combustion on the auxiliary wick 54.

In the above operation, the second wick mounting plate 42 moves vertically in unitary relation with the combustion wicks 39 and the smooth movement thereof is guided by the control and guide member 45. The above manipulation can effect continuous combustion, but after a time tarry matter may accumulate on the combustion wicks 39 and unsatisfactory combustion may result. In such a case, it is necessary to remove the tarry matter, that is, the fuel supply must be interrupted to burn the wicks 39 in the absence of fuel. When the operating shaft 18 is pulled forwardly against the force of the spring 27 from the combustion condition as shown in Fig. 5B, the engaging pin 23 is moved to a position at which it is displaced from the abutment 25' of the link plate 25 and at the same time the abutment 70 is moved to a position at which it engages the lug 75. When the operating shaft 18 is rotated under the above state, the combustion wicks 39 solely move upwardly independently of the igniting operation since now there is no engagement between the operating shaft 18 and the link plate 25. The suction wicks 43 are moved upwardly to a certain height by the action of the spring 49, but the mounting plate 42 therefor is engaged by the stoppers 48 and is held from further upward movement with the result that the combustion wicks 39 are separated from the suction wicks 43 at a position between the contact cloth members 41 and 44. The combustion wicks 39 thus burn in the absence of any fuel and any tarry matter is burnt off them.

Meanwhile, the pin 32 provided on the operating shaft 18 rides onto the stop member 31 at the bearing 28 and is engaged by the projection 30 which prevents the shaft 18 from rotating backwards. In the course

of the burning operation of the wicks 39 under no fuel supply described above, the abutment 70 on the operating shaft 18 engages the lug 75 to pivot the display plate 74 against the force of the spring 76 for thereby indicating through the window 11 of the cover member 4 that the burning under no fuel supply is now proceeding. Therefore, it is known that deposits on the wicks 39 are now being removed by merely looking into the window 11 of the cover member 4. In order to bring back the above condition to the normal operative condition after the burning under no fuel supply has been completed, the pin 32 on the operating shaft 18 is disengaged from the projection 30 and the operating shaft 18 is rotated in the reverse direction. The spring 27 acts to restore the operating shaft 18 to the original state. The display plate 74 is also urged by the spring 76 to retake the original position.

Figs. 9 through 13 show various modifications effected on the oil combustion apparatus of Figs. 1 through 8 in which the combustion wicks 39 of highly heat resisting material such as glass fibers are normally kept in close contact with the suction wicks 43 of material of high suction ability such as cotton under a normal operating condition and the former are urged away from the latter in case of, for example, unsatisfactory combustion resulting from accumulation of deposits on the former due to a long use so that the combustion wicks 39 can be burnt with no fuel supply thereto. In Figs. 9 through 13, like reference numerals appearing in Figs. 1 through 8 are used to designate like parts, and differences from the structure shown in Figs. 1 through 8 are solely described hereinunder.

In a modification shown in Fig. 9, a pinion 77 is provided to drive a wick mounting plate 33 and is in meshing engagement with a rack 78 for causing vertical movement of the rack 78. The wick mounting plate 33 is secured to the lower end of the rack 78. The pinion 77 is mounted on an inner shaft 79 which is provided with an operating knob 80 at its front end. An outer or tubular shaft 81 coaxial with the inner shaft 79 is provided with a pinion 82 at its rear end and an operating knob 83 at its front end. The pinion 82 meshes with a rack 84 to cause vertical movement of the latter. The lower end of the rack 84 freely extends downwardly through a bore in the wick mounting plate 33 and is opposed by a wick mounting plate 42. It will be seen that the pinions 77 and 82 are coaxially mounted and the knobs 80 and 83 form a double knob.

The oil combustion apparatus with the structure of Fig. 9 operates in the following manner. In a normal operating condition, the operating knob 83 is set at a predetermined position at which the lower end of the rack 84 is spaced from the wick mounting plate 42, and the operating knob 80 is suitably rotated to cause vertical movement of the combustion wicks 39 through the pinion 77 and rack 78 to adjust the combustion condition and extinguish the fire as in the case of prior combustion apparatus. Under this state, contact cloth members 41 and 44 are kept in close contact with each other by the action of a spring 49 just as in the previous embodiment of the combustion apparatus and fuel is continuously supplied to the combustion wicks 39. When it is desired to burn the wicks 39 under no fuel supply thereto, the operating knob 83 is manipulated to drive the rack 84 through the pinion 82, the rack 84 urging the wick mounting plate 42 downwardly against the force of the spring 49 to thus urge the contact cloth member 44 away from the contact cloth member 41. Therefore, fuel supply to the combustion wicks 39 is interrupted so that the wicks 39 burn in the absence of any fuel. When it is desired to supply fuel to the combustion wicks 39 again, the operating knob 83 is again manipulated to move the rack 84 upwardly away from the wick mounting plate 42, which is then urged upwardly by the action of the spring 49 so that the contact cloth member 41 and 44 are brought into close contact with each other to effect proper suction of fuel. It will be understood that, in this modification, burning of the wicks 39 for the purpose of deposit removal can easily be effected without the pulling operation of the wick operating shaft.

In a further modification of the oil combustion apparatus shown in Fig. 10, a pinion 85 for driving a wick mounting plate 33 is in meshing engagement with a rack 86 to cause vertical movement of the rack 86. The wick mounting plate 33 is secured to the lower end of the rack 86. The pinion 85 is mounted on an operating shaft 87, at the front end of which a driving knob 88 is mounted. A push rod 89 for urging a wick mounting plate 42 extends downwardly through a reservoir cover member 14 and through the wick mounting plate 33 to terminate at a position opposite the wick mounting plate 42. The push rod 89 is connected with an articulated lever system 90 for vertical movement. A manual push plate 91 is connected to the lever system 90. A helical spring 92 is provided to normally impart a downwardly directed force to a point C, hence a point B of the lever system 90. A stopper 93 is fixed on the upper face of the reservoir cover member 14 so as to limit the pivotal movement of the push plate 91 when it is urged downwardly and at the same time to hold the push plate

91 at this downward position.

The oil combustion apparatus with the structure of Fig. 10 operates in the following manner. In a normal operating condition, the driving knob 88 is manipulated to rotate the operating shaft 87. Since contact cloth members 41 and 44 are kept in close contact with each other by the action of a helical spring 49 as in the case of the previous embodiment, fuel is continuously supplied to combustion wicks 39. When it is desired to effect burning of the combustion wicks 39 under no fuel supply thereto, the push plate 91 is manually urged downwardly and held at its downward position by the stopper 93. This operation causes the points C and B to move upwardly and a point A to move downwardly. Therefore, the push rod 89 is urged downwardly to force the wick mounting plate 42 against the force of the spring 49 so that the contact cloth member 44 moves away from the contact cloth member 41. When it is desired to supply fuel to the combustion wicks 39 again, the push plate 91 is disengaged from the stopper 93, the push plate 91 moving upwardly by the action of the spring 92 to provide close contact of the contact cloth members 41 and 44 with each other.

An alternative form of the oil combustion apparatus is shown in Figs. 11 and 12. A pinion 94 is provided to cause simultaneous movement of wick mounting plates 33 and 42 in directions opposite to each other. A rack 95 is fixed at its lower end to the wick mounting plate 33 and is in meshing engagement with the pinion 94. The pinion 94 is mounted on the rear end of an operating shaft 96, at the front end of which there is provided an operating knob 97. A rack 98 for forcing the wick mounting plate 42 meshes with the pinion 94 on the opposite side of the rack 95 and is longer than the rack 95. The lower end of the rack 98 extends downwardly through a reservoir cover member 14 and through the wick mounting plate 33 to terminate at a position opposite the wick mounting plate 42.

The oil combustion apparatus with the structure of Figs. 11 and 12 operates in the following manner. In normal operation, the knob 97 is rotated within a predetermined range in which the lower end of the rack 98 is suitably spaced from the wick mounting plate 42 to drive the rack 95 to cause vertical movement of the combustion wicks 39. Under this state, fuel is continuously supplied to the combustion wicks 39 as the wick mounting plate 42 is urged upwardly by the spring 49. When it is desired to break the close contact between the contact cloth members 41 and 44, the knob 97 may be rotated beyond the predetermined range. This operation causes further upward movement of the wick mounting plate 33 and further downward movement of the rack 98. The downwardly moving rack 98 forces the wick mounting plate 42 downwardly to cause movement of the contact cloth member 44 away from the contact cloth member 41 so that the combustion wicks 39 can be burnt under no fuel supply thereto. According to this embodiment, a marked advantage can be obtained because manipulation of the single operating shaft 96 can attain the vertical movement of the wicks as well as burning of the wicks under no fuel supply thereto for the purpose of deposit removal.

Another modification of the oil combustion apparatus is shown in Fig. 13. Two projections 99 are formed at opposite positions on the outer peripheral edge of a wick mounting plate 42. Stops 100 are provided on an auxiliary reservoir body 15 at positions opposite the projections 99 in order to limit upward movement of the wick mounting plate 42 beyond the stops 100. As in the cases of the previous embodiments, means for causing vertical movement of the wicks include a rack 101, a pinion 102, an operating shaft 103 for driving the pinion 102 and a knob 104 on the operating shaft 103. In the oil combustion apparatus with the structure of Fig. 13, fuel is normally sucked up by suction wicks 43 for supply to combustion wicks 39 through contact cloth members 41 and 44 for combustion on the wicks 39. Vertical movement of the wicks 39 for normal combustion can be effected by rotating the operating knob 104 within a range in which the projections 99 may not be abutted by the stoppers 100. Under this state, the combustion wicks 39 and the suction wicks 43 are kept in close contact with each other by the action of a helical spring 49. When it is desired to effect burning of the combustion wicks 39 under no fuel supply thereto, the operating knob 104 may merely be rotated more than the predetermined range. By this rotation of the knob 104, the combustion wicks 39 are moved further upwardly but upward movement of the suction wicks 43 is limited by the abutment of the projections 99 with the stops 100. Thus, the contact between the combustion wicks 39 and the suction wicks 43 can positively be broken. This arrangement provides a marked advantage in respect of manufacture because the upper and lower wicks can be separated from each other by an extremely simple mechanism which can very easily be assembled.

The oil combustion apparatus may be modified by, for example, substituting a single cylindrical wick for the numerous circular wicks.

WHAT WE CLAIM IS:—

1. A composite wick for use for oil combustion apparatus comprising a combustion

portion made of non-inflammable material, such as glass fibres, carbon fibres, sintered alloy, or ceramics, and a suction portion made of high fuel absorbtive and fuel resisting material, such as cotton, staple fibres, asbestos or chemically synthesized fibres, the lower end of the combustion portion and the upper end of the suction portion being separably interconnected by one or more separable contact cloth members made of high fuel absorbtion-type material such as felt.

2. Oil combustion apparatus having a wick as claimed in any of the preceding claims.

3. Oil combustion apparatus as claimed in claim 2 in which a number of circular wicks are used and are disposed around the circumference of a circle or the like.

4. Oil combustion apparatus as claimed in claim 2 or claim 3 in which means are provided for separating the combustion wick portion(s) from the suction portion(s) so that a combustion wick portion can be burnt in the absence of fuel.

5. Oil combustion apparatus as claimed in claim 3 or claim 4 in which an ignition ring is provided to co-ordinate the burning of each of the combustion wicks.

6. Oil combustion apparatus as claimed in any of the claims 2-5 in which a pilot wick is provided to light the combustion wick or wicks.

7. Oil combustion apparatus as claimed in claim 6 in which electrical ignition means are provided for igniting the pilot wick.

8. Oil combustion apparatus as claimed in any of the claims 2-7 in which means are provided to display an indication of the state of combustion of the wick.

9. Oil combustion apparatus as claimed in any of the claims 2-8 in which the position of the wick portion is governed by the movement of a spindle which is operatively connected to the wick portions by a rack and pinion mechanism.

10. Oil combustion apparatus as claimed in claim 9 in which the rotation of the spindle also effects the mutual separation of the two wick portions.

11. A method of effecting the removal of unwanted deposits on the combustion portion of the wick of oil combustion apparatus as claimed in any of the claims 2-10 by separating the combustion portion of a wick from an oil suction portion of the wick and thus starving the combustion portion of fuel so that the unwanted deposits are caused to burn.

12. A wick for use in oil combustion apparatus as hereinbefore described with reference to the accompanying drawings.

13. Oil combustion apparatus as hereinbefore described with reference to the accompanying drawings.

14. A method of removing unwanted deposits on the wick or wicks of oil combustion apparatus substantially as hereinbefore described.

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1,094,465 COMPLETE SPECIFICATION
7 SHEETS

FIG. 1

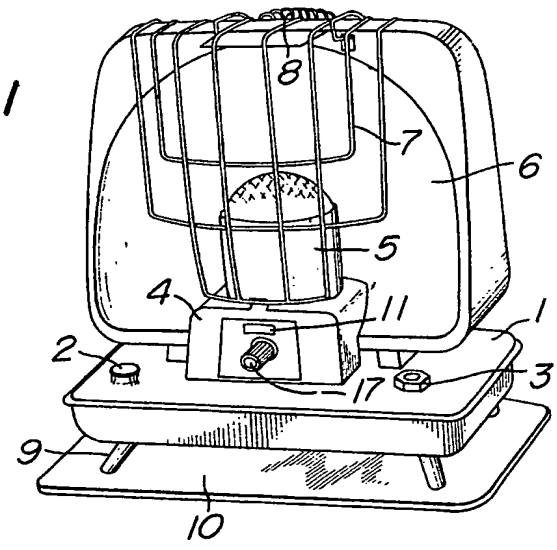


FIG. 4

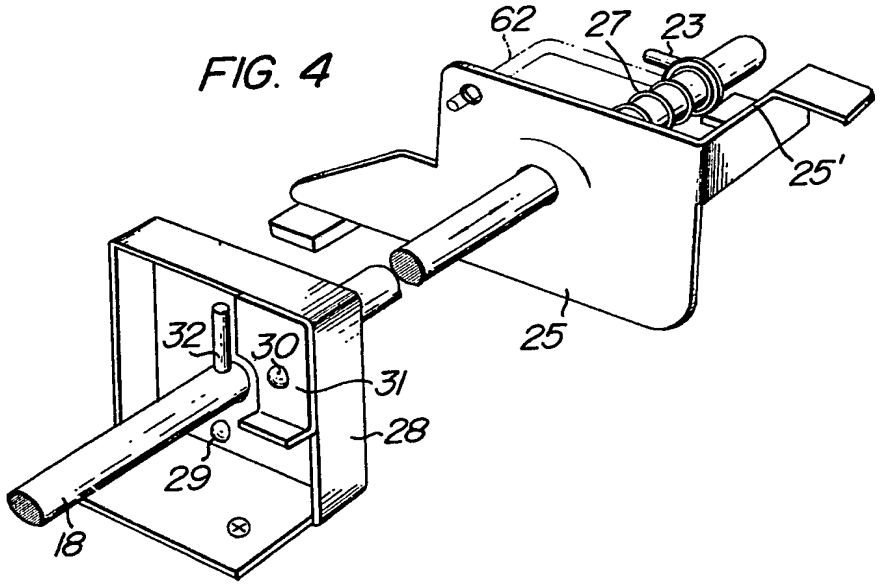
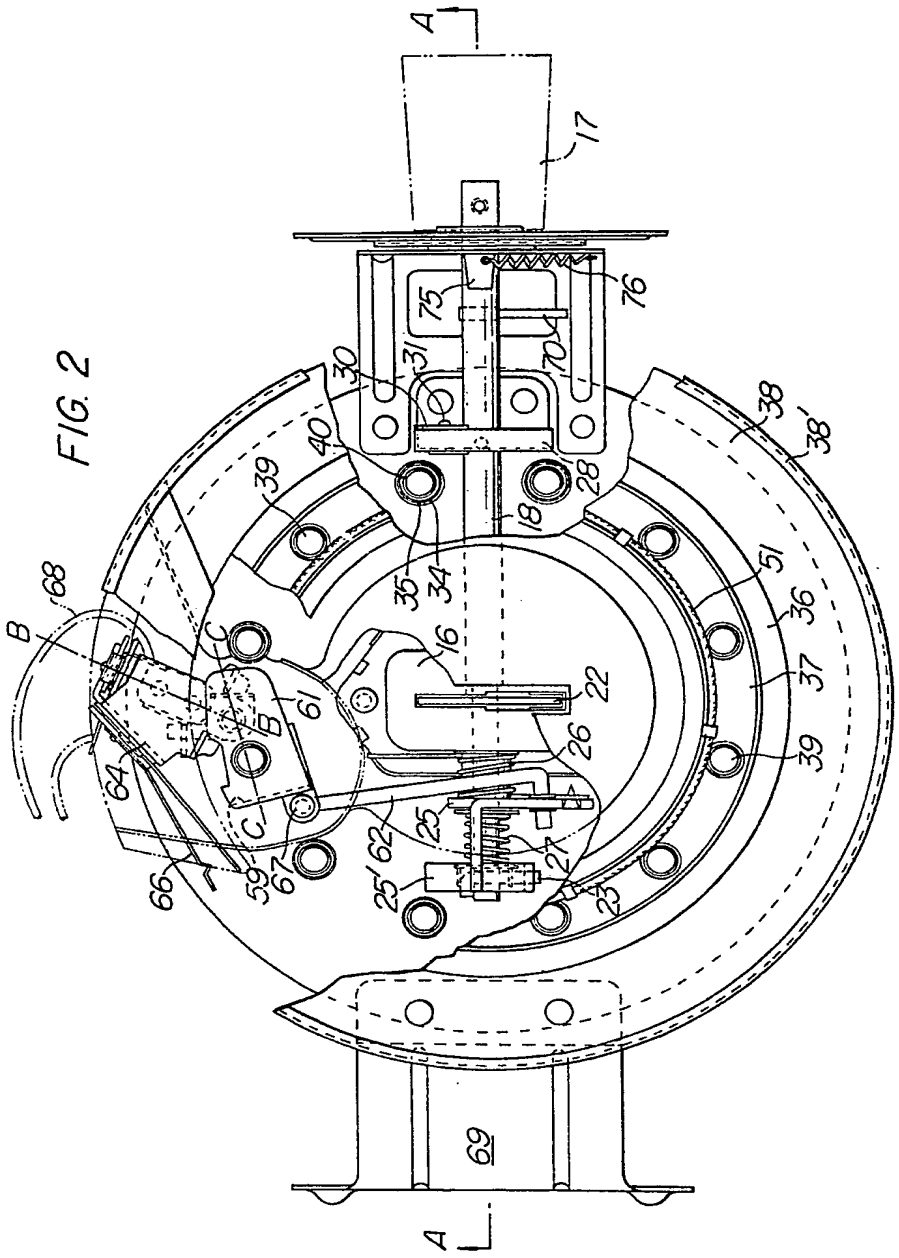


FIG. 2


A
17
75
76
70
31
30
40
39
38
38'
28
18
35
34
51
36
37
16
22
26
61
B
68
C
64
66
59
67
62
25
25'
27
23
69
A

1,094,465 COMPLETE SPECIFICATION
7 SHEETS
This drawing is a reproduction of the Original on a reduced scale.
SHEETS 2 & 3

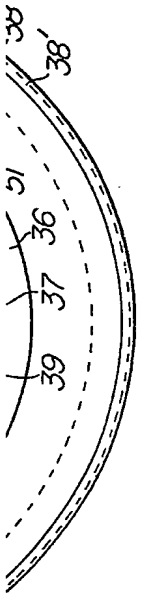


FIG. 3

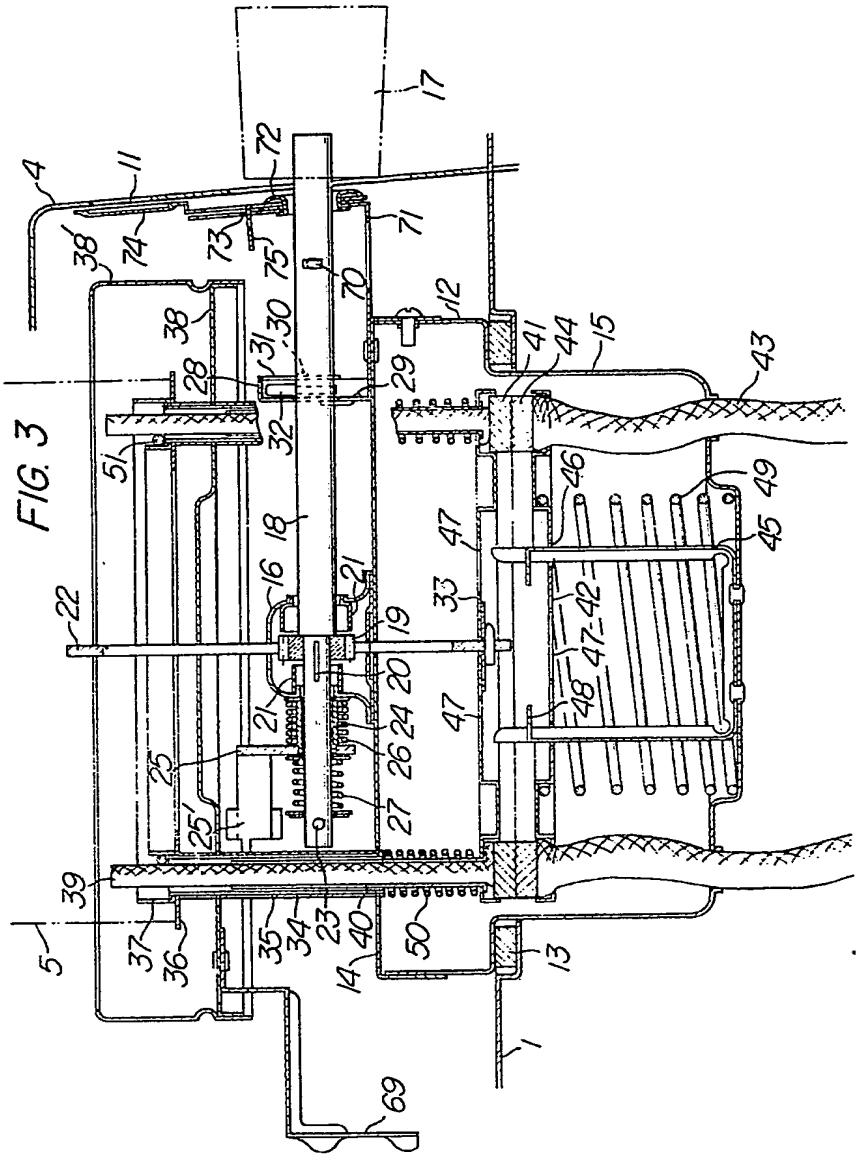


FIG. 2

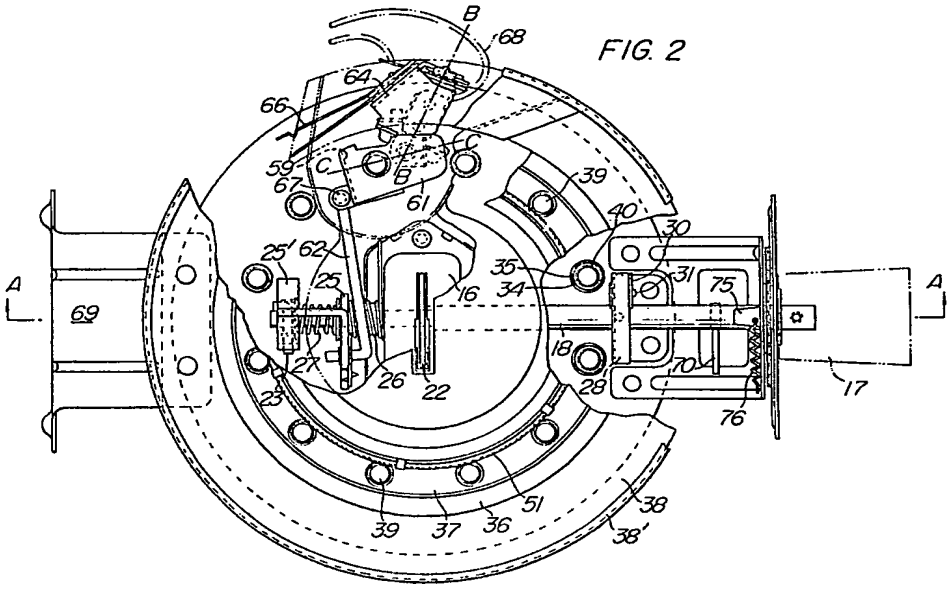
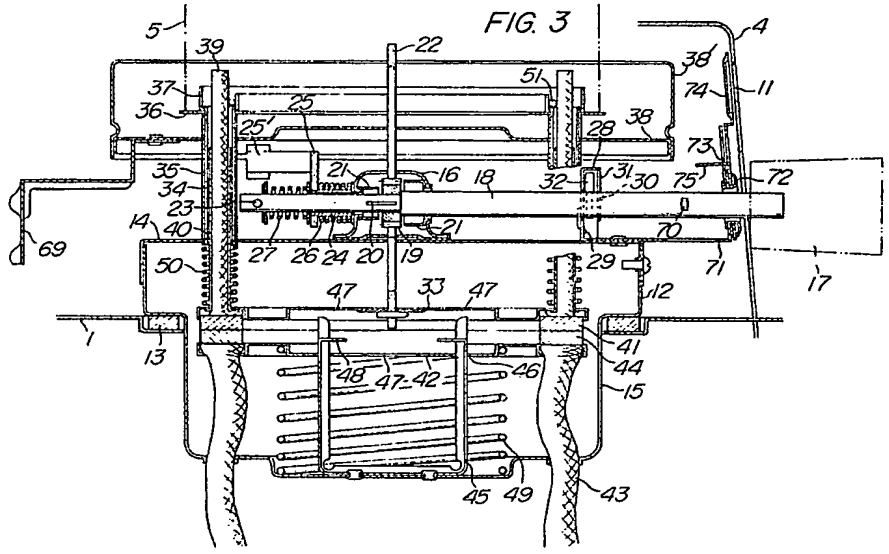


FIG. 3



SHEETS 2 & 3

FIG. 6

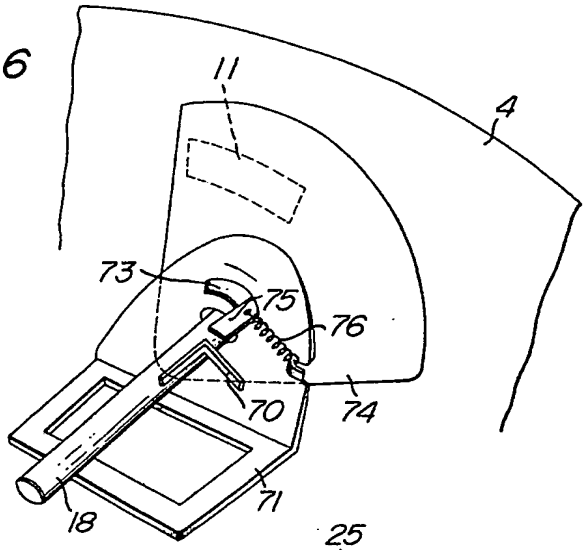
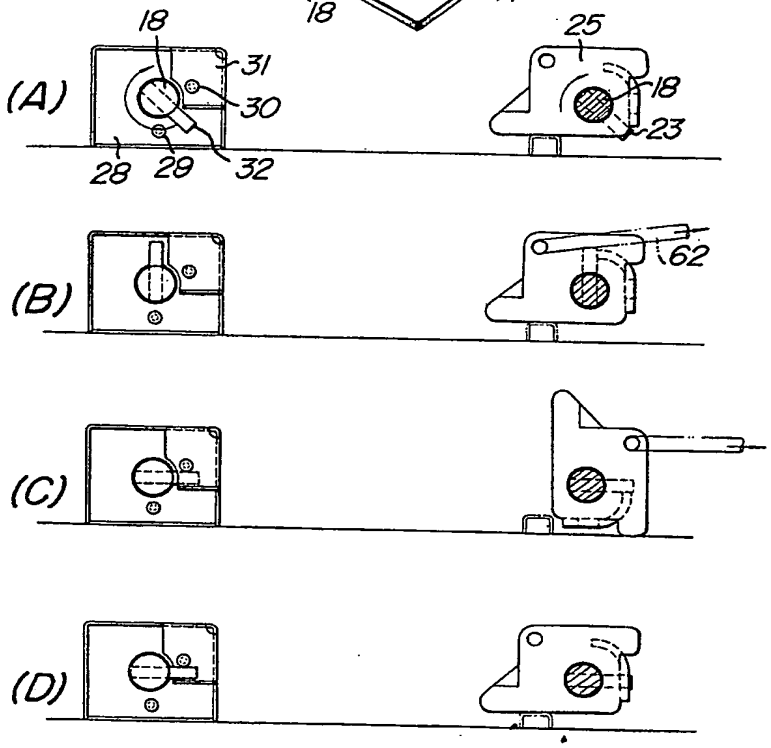


FIG. 5



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SHEETS 4 & 5

FIG. 7a

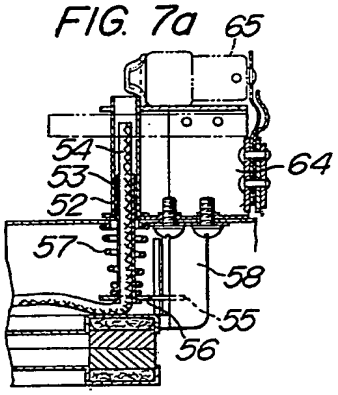


FIG. 7b

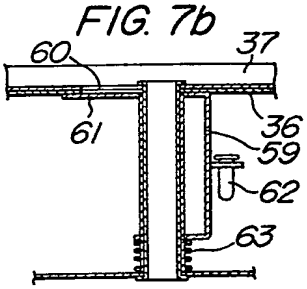
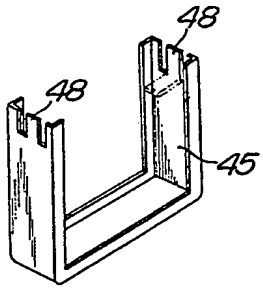
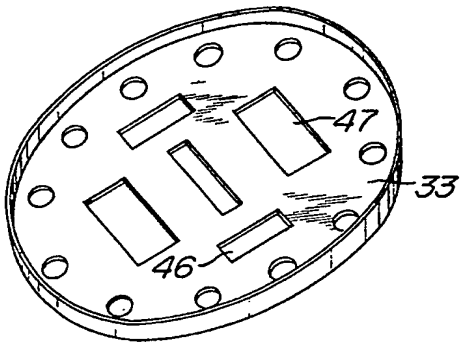
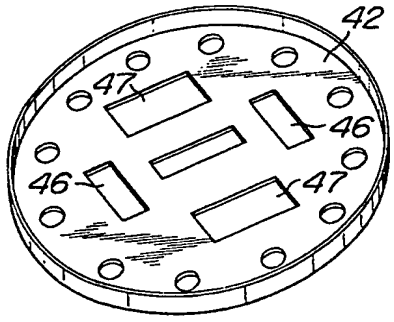


FIG. 8







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SHEETS 4 & 5

FIG. 6

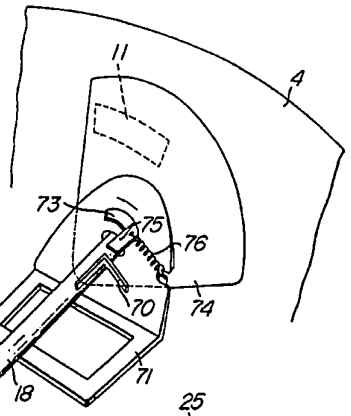


FIG. 5

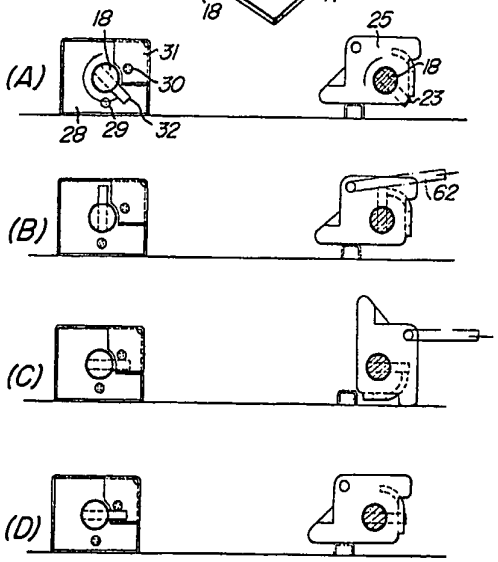


FIG. 7a

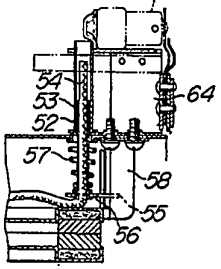


FIG. 7b

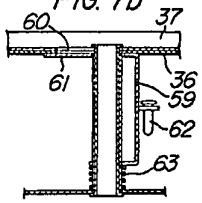


FIG. 8

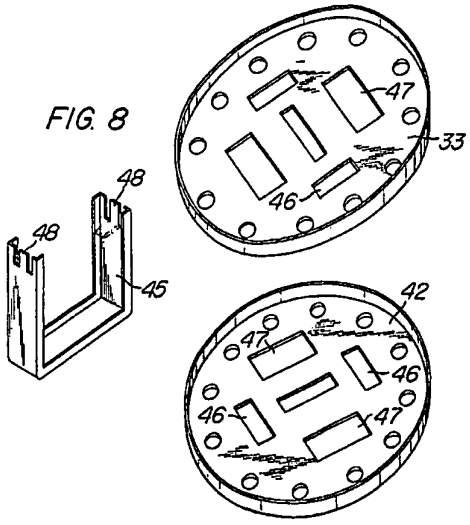


FIG. 9

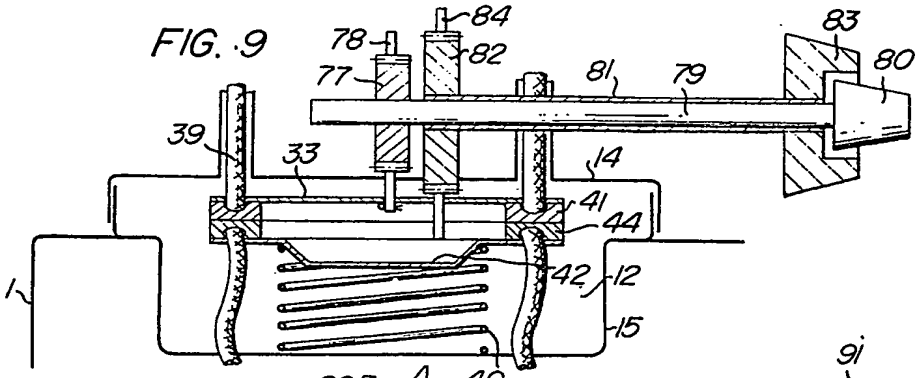


FIG. 10

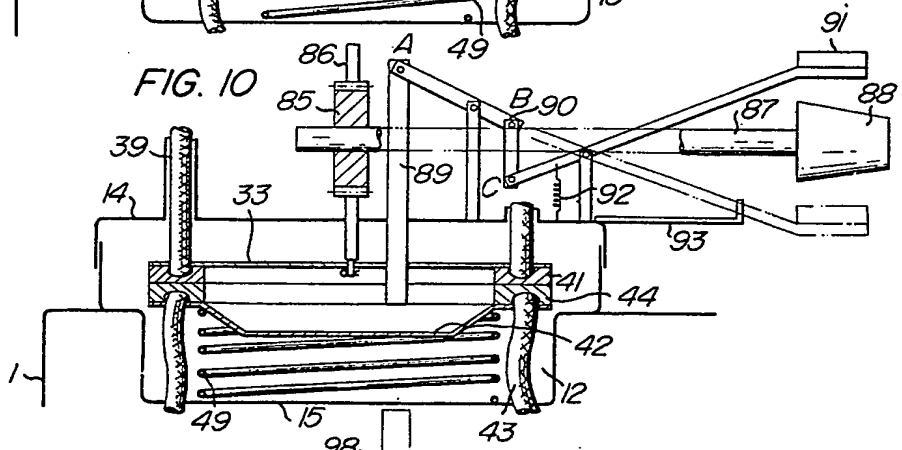
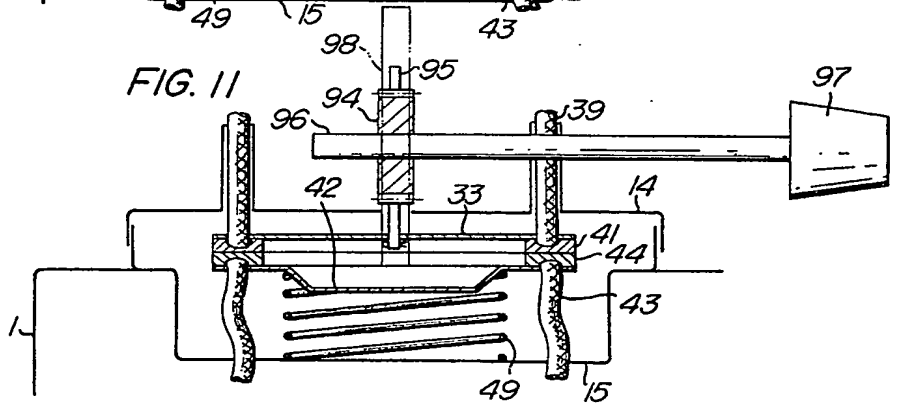


FIG. 11



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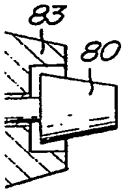
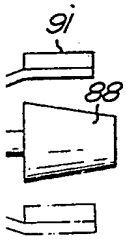
SHEETS 6 & 7





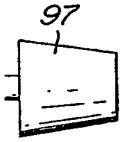


FIG. 12

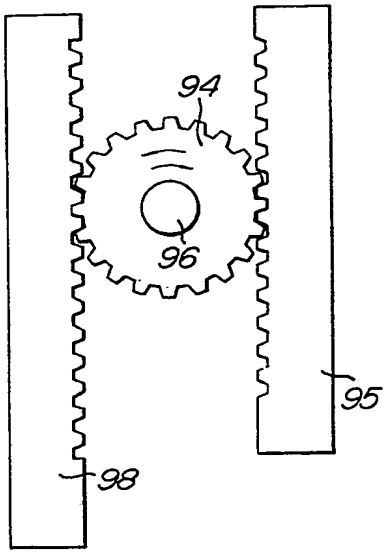
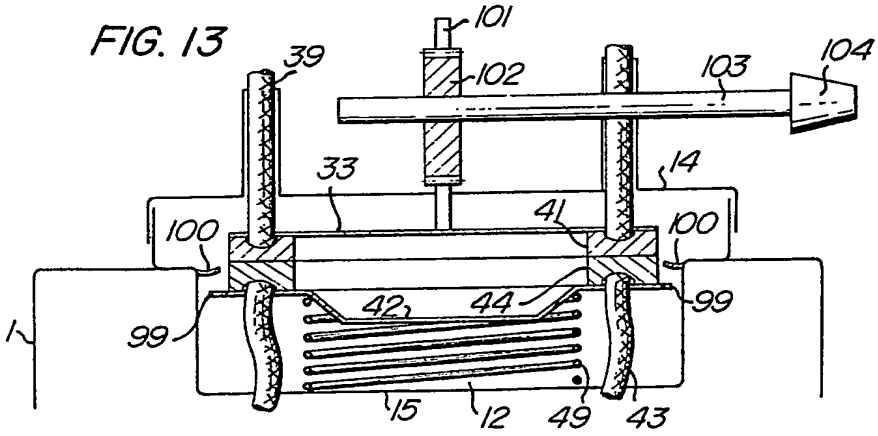


FIG. 13



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SHEETS 6 & 7

FIG. 9

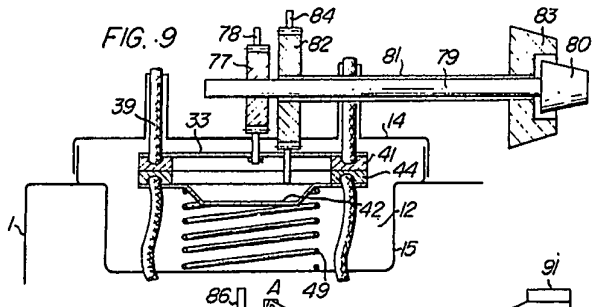

FIG. 10

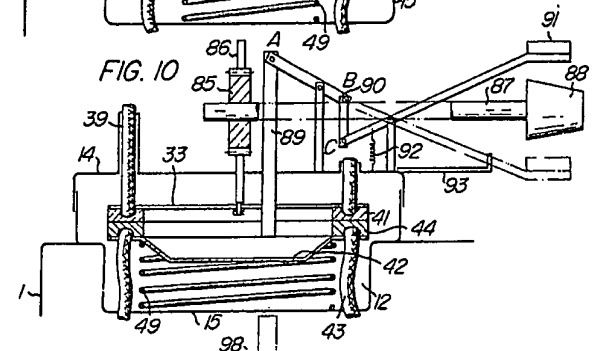

FIG. 11

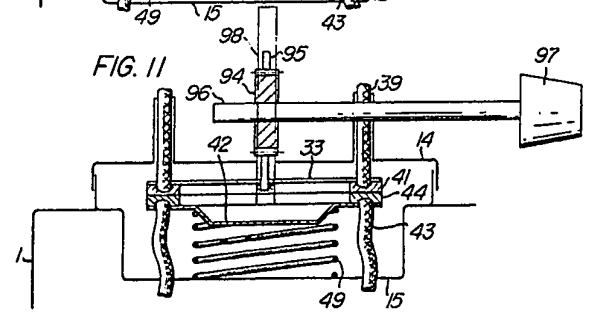

FIG. 12

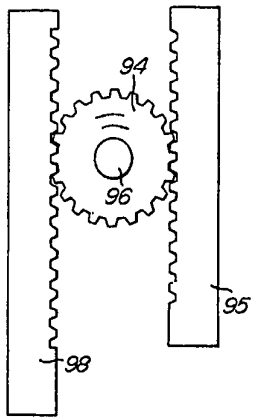

FIG. 13